CLAIMS

1. A fuel cell system characterized by comprising:

a fuel cell that receives a supply of fuel gas including hydrogen for generating electric power;

a fuel off-gas passage that is a passage for discharging fuel off-gas from the fuel cell;

a discharging mechanism that discharges the fuel off-gas from the fuel off-gas passage to outside;

a nitrogen concentration estimation mechanism for estimating a nitrogen concentration of the fuel gas in the fuel cell; and

a discharge amount control mechanism for controlling an amount of discharged fuel off-gas that is discharged by the discharging mechanism depending on the nitrogen concentration estimated by the nitrogen concentration estimation mechanism.

2. The fuel cell system according to claim 1, characterized in that the nitrogen concentration estimation mechanism estimates the nitrogen concentration from a physical quantity related to the fuel off-gas detected in the fuel off-gas passage.

3. The fuel cell system according to claim 2, characterized in that the nitrogen concentration estimation mechanism estimates the nitrogen concentration from a rate of pressure drop in the fuel off-gas passage during discharge of the fuel off-gas by the discharging mechanism.

4. The fuel cell system according to any one of claims 1 to 3, characterized in that the discharge amount control mechanism decreases the amount of discharged fuel off-gas in proportion to an increase in the nitrogen concentration when the discharging mechanism is operated while the operation of the fuel cell is stopped.

5. The fuel cell system according to any one of claims 1 to 4, characterized in that the fuel off-gas passage is connected to a fuel gas passage, which is a passage for supplying the fuel gas to the fuel cell.

6. The fuel cell system according to any one of claims 1 to 5, characterized in that the discharge amount control mechanism sets an open time of a purge valve for discharging fuel off-gas to outside longer in proportion to an increase in the nitrogen concentration of the fuel gas in the fuel cell.

7. The fuel cell system according to claim 1, characterized in that the nitrogen concentration estimation mechanism uses at least one among a pressure sensor that detects a pressure loss of between fuel gas entering and exiting the fuel cell, a pressure sensor that detects a pressure in the fuel off-gas passage, a hydrogen sensor that detects a hydrogen concentration in the fuel off-gas passage, an ultrasonic sensor that detects a sound velocity of fuel off-gas in the fuel off-gas passage, and a voltage monitor that detects a voltage of the fuel cell, in order to estimate the nitrogen concentration.

8. The fuel cell system according to claim 1, characterized in that the nitrogen concentration estimation mechanism estimates the nitrogen concentration based upon a lapsed period after performing purging to discharge fuel off-gas to outside.

9. The fuel cell system according to claim 1, characterized in that the nitrogen concentration estimation mechanism estimates the nitrogen concentration by operating the purge valve for discharging fuel off-gas to outside for a fixed open time in fixed cycles, and calculating a difference between a theoretical hydrogen consumption amount at that time and an actual hydrogen consumption amount.

10. A fuel gas control method characterized by comprising the steps of:

supplying fuel gas including hydrogen to a fuel cell to generate power;

discharging fuel off-gas to outside from a fuel off-gas passage that is a passage for discharging fuel off-gas from the fuel cell;

estimating a nitrogen concentration of the fuel gas in the fuel cell; and

controlling an amount of discharged fuel off-gas that is discharged to outside depending on the estimated nitrogen concentration.